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(54) Spatial stereoscopic image system using concave mirror

(57) A binocular image is produced in space 5 in front of the apparatus without using special spectacles. The image, which can be dynamic and in full colour, is produced as a reflection in a concave spherical mirror 2 of a pair of source images 3 & 4, one for each eye. The final image can be restricted to one observer 1 or viewed by a group of observers by using a suitable directional array 6.

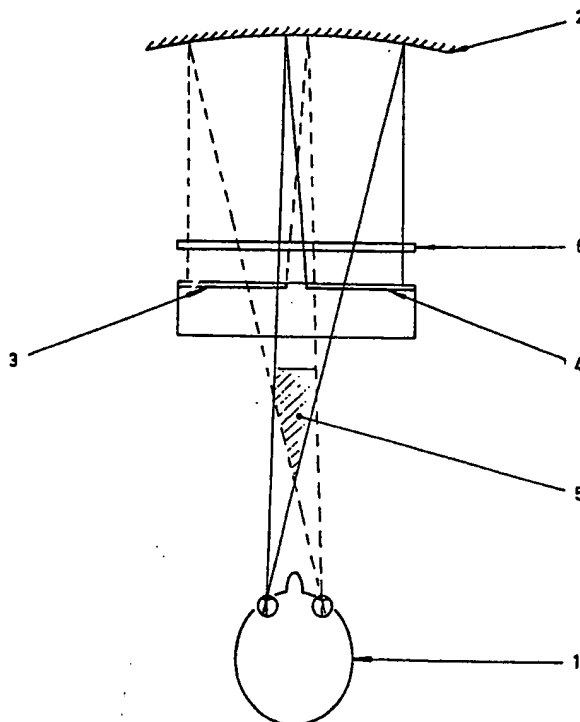


FIG. 1

*added res.
+ brightness*

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SPECIFICATION

Spatial stereoscopic image system

5 This invention relates to apparatus for the production of a stereoscopic visual image.

The human brain derives information about three-dimensional objects by processing the slightly differing images produced by each
10 eye. By reproducing two such planar images the information about the spatial nature of the original object will be deduced by the brain in the normal way. Two further cues from the eyes assist in determining positional information, the focusing and converging muscle activity. In order to give the appearance of a solid object as much of this data as possible must be reproduced.

If the image is to be viewed by more than
20 one observer some method of producing multiple images is required.

Existing devices for producing this effect rely on coloured, polarised or prismatic spectacles, arrangements of prisms or lenses in contact with a picture or photograph, or spectacles which block alternate T.V. images to the appropriate eye.

According to the present invention two superimposed images are produced in front of
30 the viewer without the need for spectacles. The resulting stereoscopic image can be in full colour and dynamic. The image appears in space between the observer and the apparatus and can be arranged to be viewed by one person only or by a group of people.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 shows a plan view of an observer
40 in front of the apparatus;

Figure 2 is a side elevation of the above;

Figure 3 is a similar side elevation showing an alternative arrangement for the display;

Figure 4 shows a section through an
45 example of a directional array.

Referring to Figs. 1, 2 & 3 the observer 1 looks into a spherical mirror 2 which reflects images of the two viewing areas 3 & 4. The positioning of these latter items is such that a real inverted image is produced in the area 5 where the fields of vision of each eye overlap, i.e. their distance from the mirror is greater than the radius of curvature. The exact position allows the image to be magnified or diminished as required.

Where a small image area is adequate two separate picture areas 3 & 4 may be employed, one for each eye. To produce a wide image the two sources must overlap. It is
50 now necessary to add a unit 6 which ensures that each eye only sees the appropriate source. This unit 6 can either take the form of a planar array as shown in Fig. 4 or a solid lattice (not illustrated) which allows more than
65 one pair of left/right images to be seen.

In Fig. 3 a plane mirror has been introduced to reduce the overall depth of the apparatus. Additional sources of visual information can be interleaved by reflection from clear glass plates (not illustrated).

In Fig. 4 the left 4 and right 3 sources are arranged in alternate vertical strips on a regular array, e.g. as by rotating a television picture through 90 degrees. Alternate lines are
75 obscured by a masking array 6 which is twice the pitch of the source array 3,4. The spacing between the array and the source is a function of the spacing between the observers eyes and the position of the viewing area 5.

There are a series of suitable viewing positions, each interspersed with a position where the left and right eye images are reversed. These unwanted positions can be masked off by a further array (not illustrated). A spatial array of vertical lines (not illustrated) is an alternative method for producing the separation of the two source images.

The information reproduced by the invention is either:-

90 a) a "three-dimensional" version of current television broadcasts, video recordings or films.

b) computer generated data e.g. C.A.D., molecular models or computer games.

95 c) textual data which has been selectively distributed between the two eyes. This enables the production of a three-dimensional V.D.U. or a secure image which can only be read correctly from one fixed position and
100 cannot be decoded from either images video signal.

or
d) any combination of the above, sequentially or simultaneously.

CLAIMS

1. An optical apparatus for the production of a real stereoscopic spatial image consisting of an observation station, a concave mirror, a multiple object position between the observation station and the concave mirror and, for larger images, a means of deriving the image appropriate to each eye, which are used to produce an apparent three dimensional representation between the observation station and the mirror.

2. An apparatus as in claim 1 in which a plane mirror is used to reduce the depth of the apparatus.

3. An apparatus as in claim 1 in which a T.V. type image is used in the object plane with a vertical raster scan where each line represents a portion of a different image to the lines adjacent to it.

4. An apparatus as in claim 1 in which a planar picture is divided into two different portions in the object plane and only appears as a complete image when seen from the observation position.

5. An apparatus in which several units as

described in claim 1 are superimposed to produce several planes of images to give greater depth to the resulting composite image.

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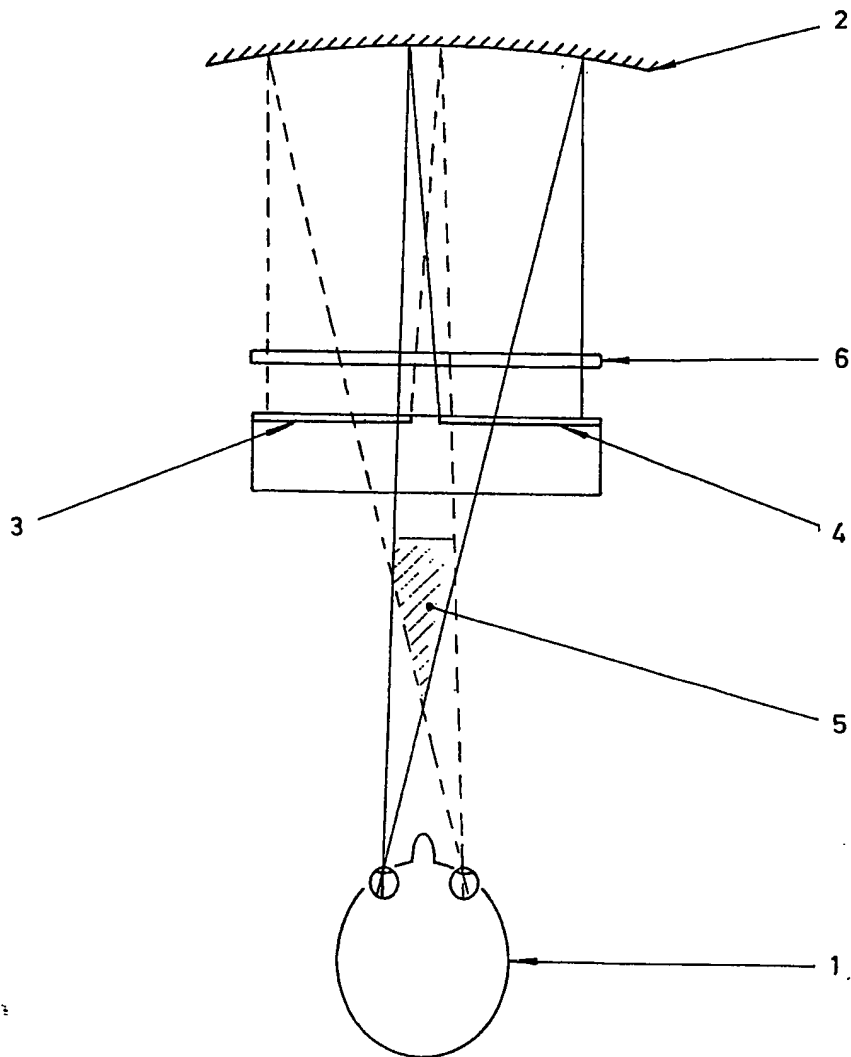


FIG. 1

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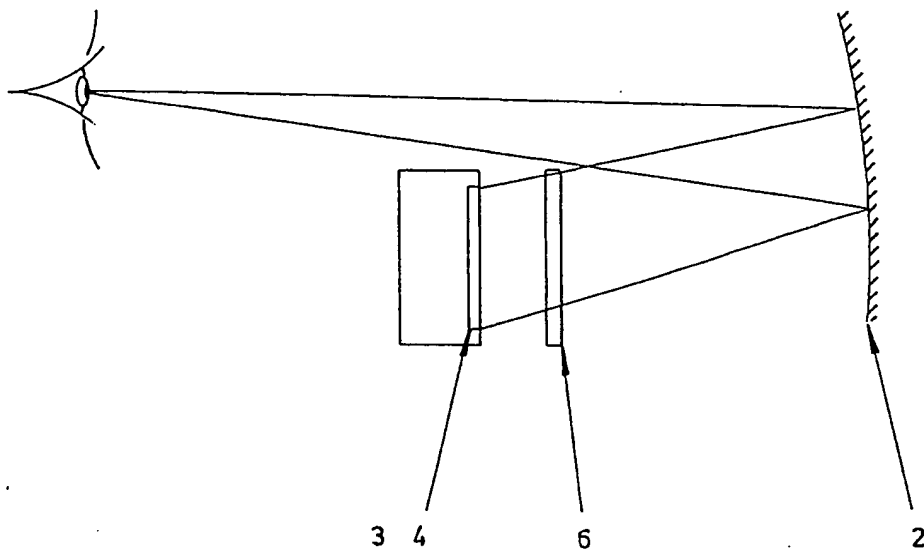


FIG. 2

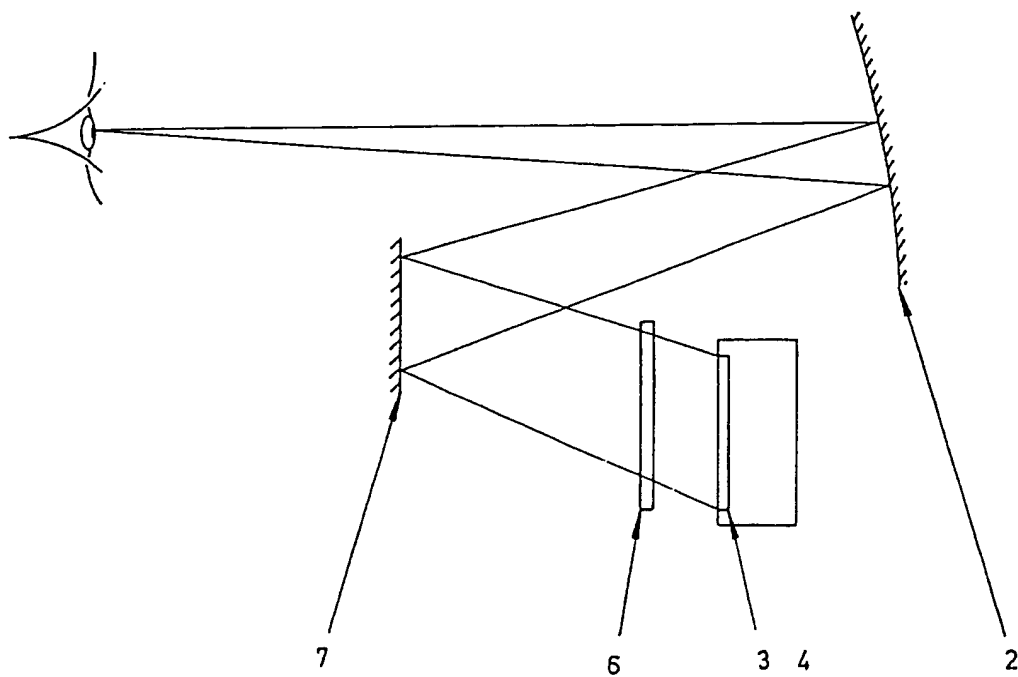


FIG. 3

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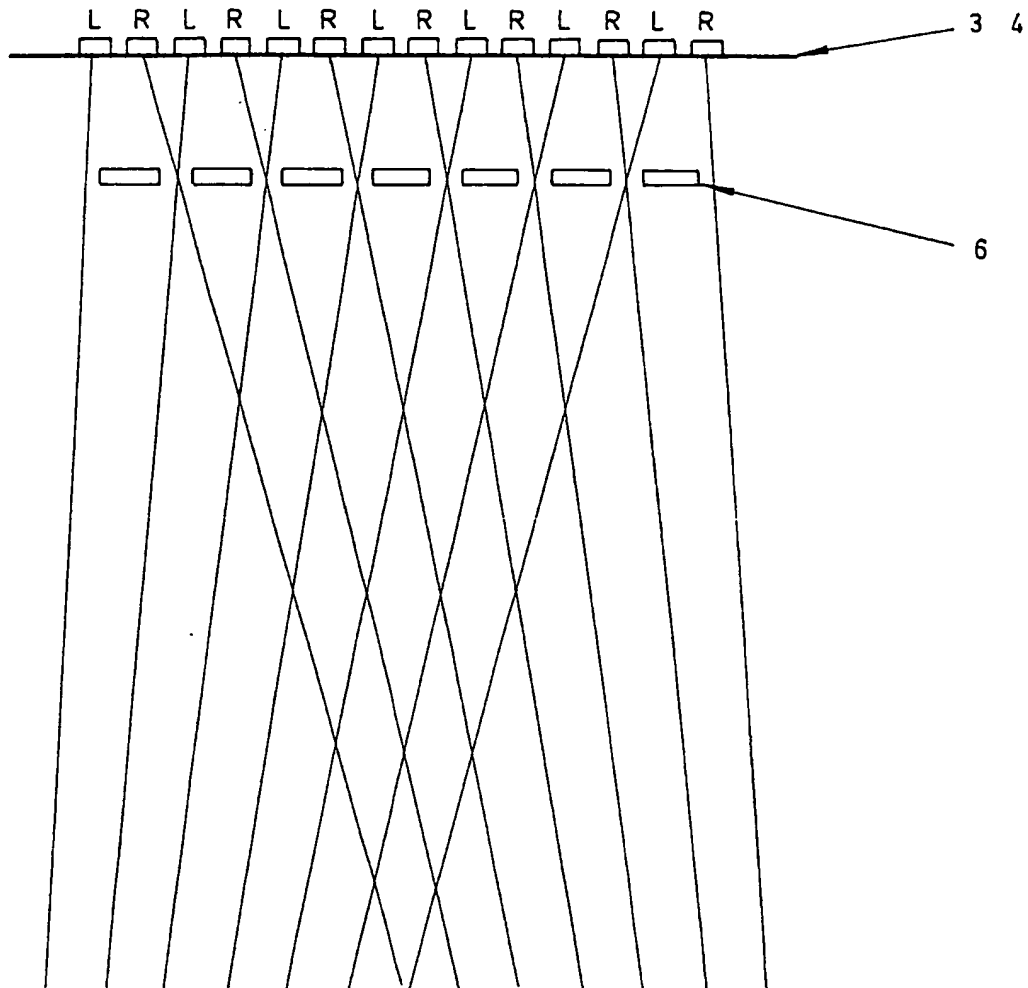


FIG. 4